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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

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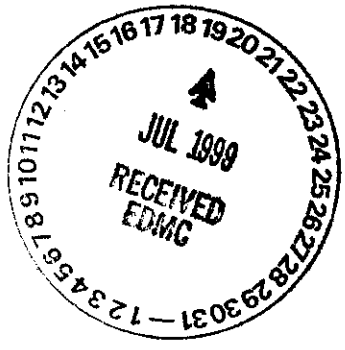

Mr. Stanislaw Leja
Acting Perimeter Areas Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 W. Fourth Avenue
Kennewick, Washington 99336-6018

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352-0539

Dear Messrs. Leja and Sherwood:

QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) GROUNDWATER (GW) MONITORING DATA FOR THE PERIOD OCTOBER 1, 1998, THROUGH DECEMBER 31, 1998

Please find enclosed the subject report. The RCRA groundwater chemistry and water level data for the subject period has been verified and evaluated. The information contained in the report is submitted to the State of Washington Department of Ecology in accordance with WAC 173-303-400 and WAC 173-303-645. The data are publicly available in electronic form in the Hanford Environmental Information System database. The electronic availability of the data and the summary provided fulfill the reporting requirements of WAC 173-303 (and by reference 40 CFR 265.94). Verification of data included a completion check (requested analyses were received), quality control checks (field blanks, field duplicates, and blind samples), and project scientist evaluation.

Sixteen RCRA sites were sampled during the reporting quarter (see enclosure, Attachment 1). Sampled sites include eight monitored under indicator evaluation programs, six monitored under GW quality assessment programs, and two monitored under final-status corrective action.

If you have questions about this quarterly data transmittal, please contact me at 373-9630.

Sincerely,

M. J. Furman, Project Manager
Groundwater Project

GWP:MJF

Enclosure

cc w/encl:
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B. M. Barnes, WMH
D. B. Barnett, PNNL
J. V. Borghese, CHI
R. C. Bowman, WMH
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S. L. Dahl-Crumpler, Ecology
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J. D. Williams, FDH

QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) GROUNDWATER MONITORING DATA FOR THE PERIOD OCTOBER 1, 1998, THROUGH DECEMBER 31, 1998.

References:
(1) RL ltr. to Stanislaw Leja from M. J. Furman "Notification of Specific Conductance Exceedance at Low-Level Waste Management Area 1 (218-E-10)," dtd. March 18, 1999 (CCN 067035).

(2) RL ltr. to Stanislaw Leja from M. J. Furman "Notification of Total Organic Carbon (TOC) Exceedance at 1301-N Liquid Waste Disposal Facility," dtd. February 25, 1999 (CCN 066172).

(3) RL ltr. to Douglas.R. Sherwood, and E.R. Skinnarland from M. J. Furman "Exceedance of Critical Mean for Total Organic Halogen (TOX) at Waste Management Area (WMA)-U," dtd. August 25, 1998 (CCN 061067).

Comparison to Concentration Limits

Contamination indicator parameter data (pH, specific conductance, total organic halogen, and total organic carbon) from downgradient wells were compared to background values at sites monitored under interim-status, indicator evaluation requirements, as described in 40 CFR 265.93.

1301-N Liquid Waste Disposal Facility: As reported previously, one downgradient well for the 1301-N facility exceeded the critical mean for TOC in September 1998 (1,525 µg/L). Results of verification sampling in January 1999 confirmed the exceedance. The State of Washington Department of Ecology (Ecology) was notified (reference 2). Because no organic constituents of concern have been identified in 1301-N waste or sediments, the contamination is assumed to come from another source and no further action is necessary for RCRA monitoring.

Low-Level WMA 1: Downgradient well 299-E33-34 exceeded the critical mean value for specific conductance in December 1998. Verification sampling was not conducted because the values were in line with the recent trend and are the result of nitrate contamination from an upgradient source (most likely the BY Cribs). A letter of notification was submitted to Ecology (reference 1). Because no wastes have been placed in the northern portion of this site and there is a known nitrate plume from an upgradient source, no further action is necessary.

Low-Level WMA 2: Upgradient well 299-E34-7 exceeded the critical mean value for specific conductance in November 1998. The upward trend was reported earlier (in April and October 1998) and is attributable to calcium and sulfate. Verification sampling is deemed not necessary.

Downgradient well 299-E34-9 exceeded the critical mean value for TOX. TOX was previously near or below detection limits in this well. The quadruplicate measurements showed poor precision (2.70, 2.85, 325, and 4.75 µg/L) and the high value is believed to be an error. A data review was requested. If no errors can be traced, this well will be re-sampled.

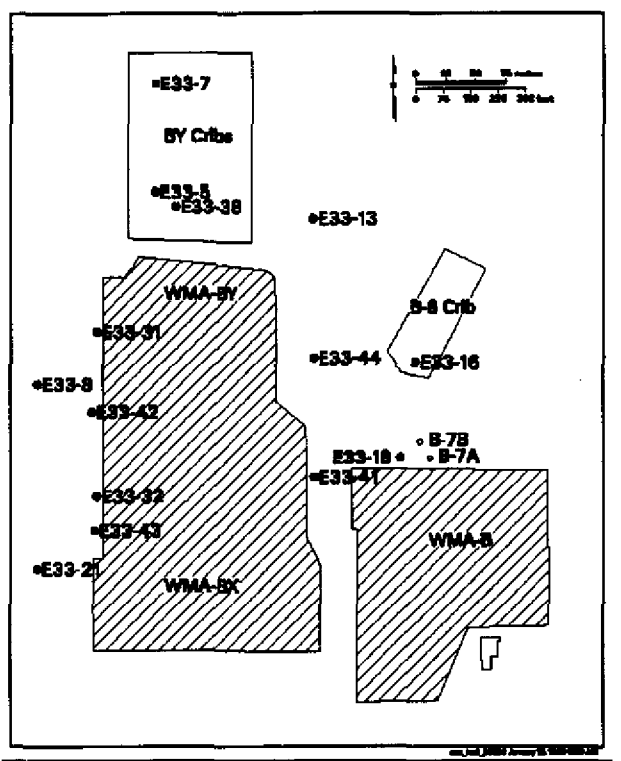
WMA-U: Field specific conductance in two newly installed downgradient wells (299-W19-41 and 299-W19-42) exceeded the critical mean value. However, laboratory analyses and relationships between cations/anions and conductivity do not support the field measurements. Verification sampling is not necessary. Efforts are underway to identify the cause of the error.

Two downgradient wells (299-W18-30 and 299-W19-42) exceeded the critical mean value for TOX. The exceedance is caused by an upgradient source and a letter of notification and assessment report were submitted to Ecology earlier (reference 3). No further action is necessary.

Contamination indicator parameters in downgradient wells were below the critical mean values for all other sites monitored under indicator evaluation requirements that were sampled during the quarter. Hence, there is no indication that these sites are impacting groundwater quality.

Status of Assessment Programs

Single-Shell Tanks WMA B-BX-BY: Work performed in support of the assessment indicates that groundwater flow in the region of WMA B-BX-BY is controlled by the structure on the basalt. Local structural highs on the basalt indicate a hummock like surface with 15 to 23 feet of relief. The aquifer ranges from 4 feet in thickness to greater than 15 feet. There is a distinct correlation between the thinner sections of the aquifer and basalt highs with water-filled troughs or channels between the local mounds. In addition, the aquifer lies primarily in a loose, unconsolidated bed of reworked Ringold boulders and cobbles and as such, should be highly transmissive. Thus, the flow direction may be locally controlled by basalt structure.



Current contaminant trends reflect these complications in the flow directions. Nitrate and technetium-99 contamination appears to be moving toward the southwest. Two additional wells will be installed along the southeast boundary of the WMA to improve the extent of the assessment coverage.

During the October-December 1998 quarter, data indicated that technetium-99 was migrating south from the northern part of the BY Crib at well 299-E33-7 to 299-E33-5 and 299-E33-38, and possibly also to 299-E33-8 and 299-E33-31 on the west side of the 241-BY Tank Farm.

Technetium-99 in well 299-E33-7 decreased slightly from 6,820 pCi/L in August to 5,630 pCi/L in November 1998. To the south, technetium-99 in well 299-E33-5 increased from 3,930 pCi/L in August 1998 to 5,000 pCi/L in November 1998. A similar increase was observed in well 299-E33-38. Farther to the southwest in well 299-E33-31, technetium-99 rose from 842 pCi/L in August 1998 to 1,330 pCi/L in November 1998. A similar change was observed in well 299-E33-8.

Technetium continued to be low to the northeast and east, generally below the 900-pCi/L drinking water standard. Well 299-E33-16, which had elevated technetium-99 in August 1998 of 1,830 pCi/L had rapidly declined to 40.4 pCi/L in November 1998. This value is suspect and is currently being reanalyzed for verification. Technetium-99 in new well 299-E33-44, installed in September 1998, decreased from 4,480 pCi/L in November 1998 to 3,970 pCi/L in December 1998. Further to the south, well 299-E33-41 decreased from 1,540 pCi/L in September 1998 to 1,110 pCi/L in November 1998. Also, well 299-E33-18 decreased from 1,040 pCi/L in August 1998 to 818 pCi/L in December 1998. Both these wells had remained static since the spring of 1998. On the west side of the WMA, technetium-99 is clearly rising in the northwest corner and levels remained about the same at wells 299-E33-32 (911 pCi/L) and 299-E33-43 (63.5 pCi/L) in November 1998.

Most of the B-BX-BY wells exceed the 45,000-μg/L maximum contaminant level for nitrate, except the southern-most wells. There are locally two centers of nitrate contamination that, in the past, roughly corresponded with the local high values in technetium-99 seen in wells 299-E33-7 and 299-E33-16. The center at 299-E33-7, north of the WMA in the BY Cribs, remained high in November 1998 (311,000 μg/L). Nitrate increased in November 1998 in BY Cribs wells 299-E33-5 and 299-E33-38 (158,000 and 166,000 μg/L, respectively). Nitrate also rose in two wells on the northwest side of the WMA (67,300 μg/L in well 299-E33-8 and 93,400 μg/L in well 299-E33-31). Farther south along the west side of the WMA, nitrate was steady or increasing, with values of 60,200 μg/L in well 299-E33-42, 50,020 μg/L in well 299-E33-32 and 9,430 μg/L in well 299-E33-43. All these wells have had increasing nitrate for at least the past year. Nitrate appears to be increasing slightly in wells 299-E33-33 and 299-E33-36, southeast of the site. For example, nitrate was 4,910 μg/L in August 1997 and has risen to 7,304 μg/L by November 1998 in well 299-E33-33.

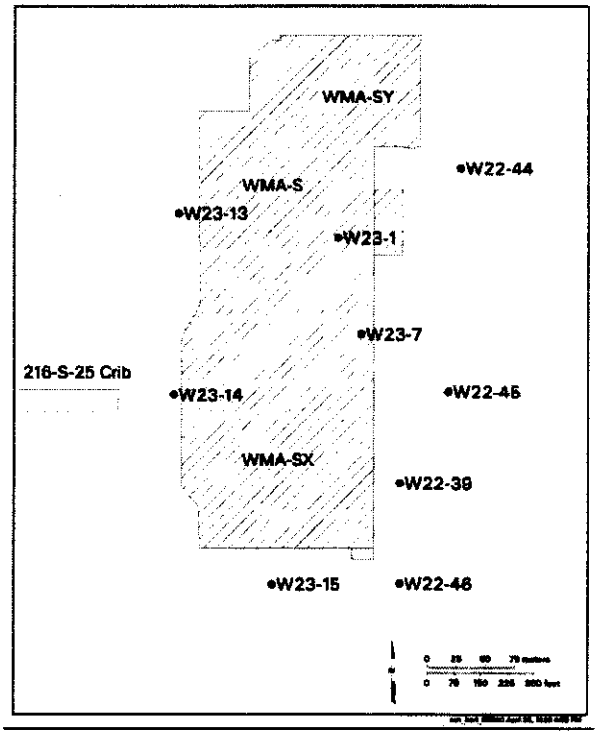
Nitrate in the area centered on well 299-E33-16 continued to rise from 460,000 μg/L in August 1998 to 491,000 μg/L in November 1998. Since February 1998, nitrate nearly doubled in concentration at this well. Nitrate at well 299-33-44 is also high (96,060 μg/L in October 1998 and 107,000 μg/L in December 1998). Unlike well 299-E33-16, which has nitrate:technetium-99 ratios of 250 to 300, this well has a ratio of 27. This implies that the source of contamination at well 299-E33-44 may be different from that at 299-E33-16. Nitrate remained low at well 299-E33-41, at 22,399 μg/L in December 1998.

In the past, uranium was found in the groundwater at WMA B-BX-BY east of 241-BY Tank Farm (north of 241-B Tank Farm) and in the southern part of the BY Cribs. Although the uranium concentration had decreased in well 299-E33-18 in August 1998 (18.8 μg/L), it rose again to 36 μg/L in December 1998, exceeding the 20-μg/L proposed drinking water standard.

Uranium remained stable in wells 299-E33-38 and 299-E33-5 (60 and 55 μg/L, respectively, in November 1998). Uranium remained high at 270 μg/L in well 299-E33-44 and continued to increase slightly on the west side of the WMA in wells 299-E33-8, 299-E33-31, and 299-E33-42 (levels ranged between 4.94 and 9.66 μg/L). There is no uranium measured in wells further to the south. However, uranium decreased in well 299-E33-18 from 137 μg/L in August 1998 to 118 μg/L in December 1998.

Single-Shell Tanks WMA S-SX: Technetium-99 exceeded the 900-pCi/L drinking water standard in two downgradient RCRA wells (299-W22-45 and 299-W22-46). The technetium-99 concentration in well 299-W22-46 in December was 3,670 pCi/L and has declined from the maximum of 5,020 pCi/L that occurred in 1997. The concentration in well 299-W22-45 (1,160 pCi/L) doubled since the previous quarter. Concentrations in this well have been on an upward trend over the last four quarters.

The drinking water standard for nitrate (45,000 μg/L) continued to be exceeded in downgradient well 299-W22-46, the same well with the elevated technetium-99. The nitrate concentration for this well was 45,500 μg/L, compared to 50,400 μg/L the previous quarter, and its decline coincides with technetium-99.



Tritium exceeded the 20,000-pCi/L drinking water standard in one upgradient well and in one downgradient well. The concentration in upgradient well 299-W23-14 was 319,000 pCi/L, compared to 41,700 pCi/L in downgradient well 299-W22-46. Concentrations in this downgradient well have declined from the maximum of 65,200 pCi/L in 1997. The primary source of the tritium in these wells is attributed to residual contamination from past-practice crib disposal sites (e.g., 216-S-25). Also, tritium concentrations in downgradient wells 299-W22-39 and 299-W22-45 continued to increase and are approaching the drinking water standard (19,500 and 18,800 pCi/L respectively).

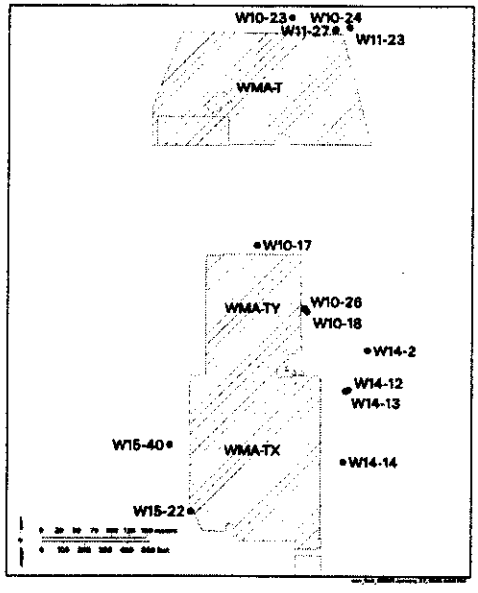
There were no detection's of either strontium-90 or cesium-137 in any RCRA monitoring wells in the network. However, these constituents have been previously detected in non-RCRA well 299-W23-7, located inside the S-SX Tank Farm fence line. Elevated gross alpha was also reported in the last quarter. Follow-up isotopic analyses on unfiltered and filtered samples from this well indicated that the gross alpha activity was due to uranium (mostly particulate). Plutonium-238, plutonium-239/240 and americium-241 were all below detection limits (<0.1 pCi/L) in filtered or unfiltered samples. All samples collected from this well must be obtained

with a bailer or discrete depth sampler (no purging) because of the limited recharge to the well. Consequently, the samples are highly turbid and are not likely to be representative of aquifer conditions.

Anomalous, high chromium and iron concentrations (91 and 500 μg/L, respectively) were reported for filtered samples from well 299-W23-15 in December 1998. These concentrations are not consistent with previous results, and a data evaluation will be conducted. Anomalous, high values of field specific conductance for this well and for well 299-W22-46 was attributed to problems with field specific conductance measurements.

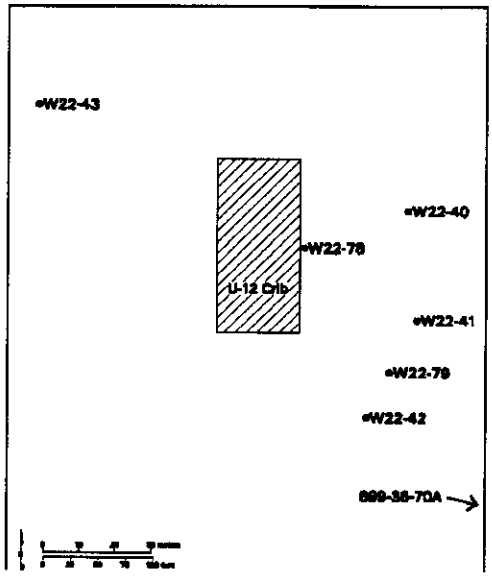
Single-Shell Tanks WMA T and TX-TY: Water levels near these WMA's continued to decline, and well 299-W15-22 can no longer be sampled. The new well, 299-W15-40, is the upgradient replacement for well 299-W15-22. WMA T downgradient well 299-W11-27 and WMA TX-TY downgradient well 299-W14-12 were not sampled during this quarter because of scheduling difficulties.

Technetium-99 activity in well 299-W11-23, a non-RCRA well located approximately 30 m east of 299-W11-27, rose to 8,540 pCi/L in November 1998. This increase in technetium-99 was accompanied by increases in nitrate, chromium, and calcium, consistent with the contaminant fingerprint in well 299-W11-27. The chromium concentration in November 1998 was 129 μg/L.



Groundwater chemistry in WMA TX-TY well 299-W10-17 did not change significantly since the last sampling. Well 299-W10-17, one of the wells that initially placed WMA TX-TY in assessment, is no longer downgradient to the WMA, but is cross-gradient or marginally upgradient to the northeast corner of the WMA.

Well 299-W14-13, drilled to replace 299-W14-12, was sampled in December 1998 and shows the influence of a high tritium, high iodine-129 plume previously noted in wells 299-W14-2 and 299-W14-12. Tritium in well 299-W14-13 in December 1998 was 832,000 pCi/L, iodine-129 was 37 pCi/L, technetium-99 was 1,550 pCi/L, nitrate was 257,000 μg/L, and chromium was 180 μg/L. The source of the high tritium/iodine-129 component is unclear, but the most likely source is operation leaks from the nearby 242-T Evaporator, which was closed in the early 1970's.



216-U-12 Crib. New well 299-W22-79 was sampled for the first time this quarter. This new well is located

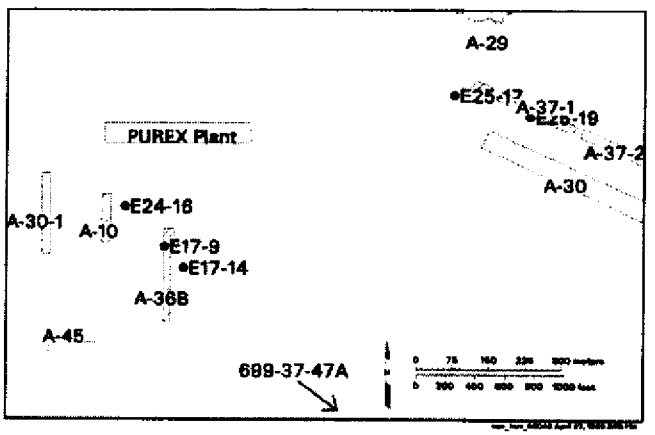
approximately halfway between triggering downgradient wells 299-W22-41 and 299-W22-42. The hydrochemistry and radiochemistry data for this new well indicate that it is on trend with the surrounding well plume data. One existing well, 299-W22-40, was removed from the network because it was dry. The revised downgradient network is composed of wells 299-W22-79, 299-W22-41, 299-W22-42, and 699-36-70A.

Specific conductance in downgradient wells 699-36-70A and 299-W22-41 continued to exceed the critical mean value (457.8 μS/cm). Results for nitrate, the principal constituent causing elevated specific conductance at the crib, were above the 45,000-μg/L maximum contaminant level in all of the downgradient wells. The nitrate values for wells 299-W22-41, 299-W22-42, new well 299-W22-79, and 699-36-70A, were 206,100, 112,050, 78,300, and 117,000 μg/L, respectively. The nitrate in well 299-W22-41 has decreased from a September 1998 value of 242,100 μg/L; however nitrate in well 299-W22-42 has increased from a September 1998 value of 90,900 μg/L.

Technetium-99 (a constituent associated with the site) remained far below drinking water standards, but elevated above background in wells 699-36-70A, 299-W22-41, 299-W22-42, and new well 299-W22-79 (ranging from 37.0 pCi/L to 92.7 pCi/L in these wells). Tritium and iodine-129, two regional contaminants, remained elevated above their drinking water standards. Tritium in wells 699-36-70A, 299-W22-42, and new well 299-W22-79 was 95,000, 48,300, and 22,300 pCi/L, respectively. Iodine-129 in these wells was 15.2, 7.64, and 2.58 pCi/L, respectively. The overall trends for tritium indicate that the tritium plume may be moving farther east, away from the crib.

In upgradient well 299-W22-43, specific conductance (298 μS/cm) and the associated nitrate (13,900 μg/L) decreased slightly compared to the last quarter. Technetium-99 and gross beta decreased this quarter. The technetium-99 activity for this quarter was 27.7 pCi/L.

PUREX Cribs (216-A-10, 216-A-36B, and 216-A-37-1): The maximum contaminant levels for manganese and nitrate and the interim drinking water standards for iodine-129, tritium and strontium-90 continued to be exceeded in some of the near-field wells at the PUREX Cribs during the fourth quarter of 1998. In addition, arsenic continued to be detected at all near-field wells, and specific conductance and gross beta remained elevated.



Iodine-129 activity remained above the interim drinking water standard (1 pCi/L) at all up- and down-gradient wells near the PUREX Cribs. The highest activity measured was at well 699-37-47A (21.9 pCi/L). This is greatly increased from a value of 2.32 pCi/L measured for April 1998.

Tritium activity remained above the interim drinking water standard (20,000 pCi/L) at all up- and down-gradient wells near the 216-A-10 and 216-A-36B Cribs and one downgradient well near the 216-A-37-1 Crib. The highest tritium activity at the PUREX Cribs (and the entire 200 Areas) was 3,870,000 pCi/L at well 299-E17-9 near the 216-A-36B Crib. This is an increase from a value of 3,400,000 pCi/L measured for April 1998. The trend for the period from about 1990 to present has been relatively stable.

Strontium-90 activity remained elevated at the 216-A-10 and 216-A-36B Cribs. One well, 299-E17-14, remained above the interim drinking water standard (8 pCi/L) with an activity of 17 pCi/L. This is a localized occurrence of strontium-90.

Manganese concentration continued to be above the drinking water standard (50 μg/L) at one downgradient well near the 216-A-37-1 Crib. Well 299-E25-19 had a concentration of 64.0 μg/L. The other downgradient well in the near-field well network at the 216-A-37-1 Crib (well 299-E25-17) had a concentration of 48 μg/L.

Nitrate concentrations remained above the maximum contaminant level (45,000 μg/L) at four downgradient wells at the 216-A-10 and 216-A-36B Cribs and were also high at the other wells near-field of the PUREX Cribs well network. The highest concentration during the fourth quarter of 1998 was 192,000 μg/L at well 299-E17-9. Arsenic was detected in all wells of the PUREX Cribs near-field well network, but concentrations remained less than the maximum contaminant level (50 μg/L). Specific conductance remained elevated in downgradient wells near the 216-A-10 and 216-A-36B Cribs, due to high levels of nitrate. The highest value was 711 μS/cm at well 299-E17-9.

Gross beta was elevated at well 299-E17-14 (110 pCi/L), well 299-E24-16 (33.6 pCi/L), and at several other wells downgradient of 216-A-10 and 216-A-36B Cribs. These results are consistent with the presence of strontium-90. Strontium-90 activity at well 299-E17-14 was 17.0 pCi/L. Strontium-90 activities have been increasing slightly at well 299-E17-14 for approximately 1.5 years, but have not exceeded levels reached in 1992 (17.5 pCi/L).

Forty-two other wells located farther downgradient of the PUREX Cribs than the near-field wells are within the far-field well network of the PUREX Cribs. These other wells are sampled either on a frequency of once per year or once every three years. Results of monitoring these more distant wells will be reported in the annual report of groundwater monitoring at the Hanford Site.

Other Monitoring Changes

Specific conductance in one downgradient well for the 216-A-29 Ditch (299-E25-35) has been increasing since 1996 and was 354 μS/cm in October 1998. The rise of specific conductance is caused by increases in nonhazardous constituents (sulfate, calcium, and sodium).

The statistical evaluation for the 216-S-10 Ditch and Pond was based on one upgradient and two downgradient wells. Downgradient well 299-W26-10 went dry and could not be sampled in the October-December 1998 quarter. A new downgradient well will be installed this year.

Quality Control

Results of the RCRA quality control program for the October through December 1998 quarter will be discussed in the annual report for fiscal year 1999. Highlights are summarized in the attachment. Quality control data that are not available in the Hanford Environmental Information System are available in electronic form upon request. The quality control program indicated that the data were acceptable for use in the statistical comparisons discussed above. The field specific conductance values appeared to be in error, as discussed previously.

Table 1. Status of RCRA Sites, October - December 1998.

Site	Routine sampling Oct-Dec 1998	Statistical exceedance
Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)		
100-D Ponds	No	Not applicable
1301-N Facility	No	Not applicable
1325-N Facility	No	Not applicable
1324-N/NA Site	No	Not applicable
B-Pond	No	Not applicable
A-29 Ditch	Yes	No
B-63 Trench	Yes	No
S-10 Pond and Crib	Yes	No
LERF	No	Not applicable
LLBG WMA 1	Yes	Yes[1]
LLBG WMA 2	Yes	Yes[1]
LLBG WMA 3	No	Not applicable
LLBG WMA 4	No	Not applicable
SST WMA A-AX	Yes	No
SST WMA C	Yes	No
SST WMA U	Yes	Yes[1]
NRDWL	No	Not applicable
Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)		
Six sites[2]	Yes	Not required
Final Status Sites (WAC 173-303-645)		
300 Area Process Trenches	Yes	Yes[3]
183-H Basins	Yes	Not applicable[3]

LERF = Liquid Effluent Retention Facility
LLBG = Low-Level Burial Grounds
NRDWL = Nonradioactive Dangerous Waste Landfill
SST = Single-Shell Tanks
WMA = Waste Management Area

[1] Exceedance did not indicate hazardous contamination from the RCRA unit. See text for explanation.
[2] U-12 Crib, PUREX Cribs, SST WMA B-BX-BY, SST WMA S-SX, SST WMA T, SST WMA TX-TY.
[3] Site has entered corrective action because of previous exceedances.

Quality Control (QC) Results, October through December 1998

Completeness: Completeness of data is determined by dividing the number of results that have not been rejected or flagged as suspect because of associated QC concerns by the total number of results received during the quarter. Greater than 90 percent completeness is considered acceptable. The suspect data may be useful for general interpretive use but should not be used to make regulatory decisions. Out of a total of 23,706 results, 91 percent of the results were considered valid for the October through December 1998 quarter. The criteria for applying Q flags were changed this quarter to enhance their usefulness (see details under field duplicates and blanks below).

Field QC data: Field duplicates with at least one result greater than 5 times the detection limit must be within 20 percent of each other to be acceptable. Unacceptable results are flagged with a Q in the database. Before this quarter, the criterion was only applied when both results were greater than five times the detection limit. This failed to generate Q flags when one result was less than the detection limit and the other duplicate was much greater. 664 pairs of results were generated from 15 duplicate samples during the quarter. 16 pairs of results differed by more than 20 percent. Four pairs had unacceptable precision for more than one constituent. Two of these were for unfiltered metals, which could differ from sample to sample. Poor alkalinity results for one sample pair are believed to represent a swapped sample in the field or lab. Poor agreement for acetone and methylene chloride may have resulted from laboratory contamination; similar levels of these compounds were found in the method blanks. The reasons for the poor duplicate agreement for chloroform, cyanide, and gross beta are unknown. The lab has been asked to reanalyze the affected samples for cyanide and gross beta.

Field duplicates from last quarter exhibited poor agreement for total dissolved solids, cyanide, metals, gross alpha, gross beta, and technetium. In most cases, reanalysis of the samples produced acceptable results, suggesting that the poor precision were due to swapped samples or analytical problems at the lab. Exceptions include a pair of results for lead (unfiltered samples), gross alpha, gross beta, and technetium. These latter results appear to confirm that the samples in question had different compositions.

Full trip blanks, field transfer blanks, and equipment blanks are used to check for contamination in bottle preparation and/or field activities. Results from groundwater samples that are associated with an out-of-limit field blank are flagged with a Q in the database. The criteria for determining which samples are associated with field blanks were changed for the fourth quarter. For full-trip and field-transfer blanks, an associated sample is one that was collected on the same day and analyzed by the same (or a comparable) method as the blank sample. Previously, any sample collected or analyzed on the same day by the same method as a field blank was considered an associated sample. For equipment blanks, associated samples are only those samples collected on the same date using the same type of sampling equipment. Any additional changes involve field blanks collected for special projects. Because these types of field blanks are potentially different in nature than routine well samples, special-project blanks are only

associated with groundwater samples collected on the same date from the same well. These changes were implemented in an effort to enhance the usefulness of the Q flags in the database.

A total of 1,990 results were produced from field blank samples this quarter. 66 results from routine field blanks exceeded the QC limits for field blanks (~3 percent). Most of the flagged results were for anions and metals are at insignificant concentrations when compared to background groundwater chemistry. Possible exceptions are for some organic constituents, but most of these were found at levels less than five times the QC limit. An additional 110 results were out of limits for blanks collected during drilling of 2 new wells, possibly indicating incomplete decontamination of sampling equipment used during drilling operations.

Blind Standards: Double-blind standards were prepared and submitted to the primary laboratory in November 1998. Splits of the standards for TOC, gross beta, and iodine-129 were submitted to an alternative laboratory. Most of the standards were prepared in a groundwater matrix, although standards containing cyanide and organics were prepared using organic free, deionized water. Standards for indicator analyses were spiked using the following constituents: TOC = potassium hydrogen phthalate; TOX-phenol = 2,4,6-trichlorophenol; TOX-VOA = mixture of carbon tetrachloride, chloroform, and trichloroethene; gross alpha = plutonium-239; and gross beta = strontium-90.

The acceptance limits for blind standard recoveries vary by constituent but are generally 75 –125 percent except for chromium, which has limits of 80 – 120 percent, and specific radionuclides, which have a ± 30 percent acceptance range. Most results were acceptable, indicating good analytical performance overall. However, the primary lab's recoveries for TOX-VOA and cyanide were both below the QC limits. These constituents also had several low recoveries during the first three quarters of 1998. The problem is being investigated.

The alternative lab had unacceptable results for gross beta and iodine-129. Reanalysis requests have been submitted for those standards.

Laboratory QC Data: Laboratory QC data include the results from method blanks, laboratory control samples, matrix spikes, matrix spike duplicates, surrogates, and matrix duplicates. This information provides a means of assessing laboratory performance and the suitability of a method for a particular sample matrix. Laboratory QC data are not currently used for in-house validation of individual sample results unless the lab is experiencing unusual performance problems with an analytical method.

Results for method blanks were evaluated based on the frequency of detection above the blank QC limits. In general, these limits are two times the method detection limit or instrument detection limit for chemical constituents and two times the total propagated error for radiochemistry components. For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the QC limit is five times the method detection limit. The metals category had the greatest percentage of method blank results exceeding the QC limits, with 20.4 percent exceeding twice the instrument detection limit. Most of these results were for aluminum, calcium, iron, magnesium, manganese, sodium, vanadium, and zinc. For all other categories, the QC limits were exceeded by fewer than seven percent of the method blanks. Nonmetal constituents with ten or more measurements that had greater than

10 percent of method blanks outside the QC limits included conductivity (100 percent), chloride (25 percent), acetone (39 percent), and methylene chloride (13 percent). The highest method blank results for these constituents were: 1.03 µS/cm for conductivity, 14 µg/L for acetone, 5 µg/L for methylene chloride, and 0.1 mg/L for chloride. The positive method blanks for conductivity do not appear to be a significant problem because groundwater conductivity is two orders of magnitude greater than the highest blank value.

Laboratory control sample recoveries were excellent for all evaluated categories. For matrix spikes and matrix spike duplicates, the percentages of out-of-limit results were as follows: 5.4 percent for indicator parameters, 11 percent for ammonia and anions, 0.8 percent for metals, and 10 percent for radiochemistry parameters. Constituents with 10 or more measurements that had greater than 10 percent of matrix spikes outside QC limits included chloride, nitrate, nitrite, lead, and uranium. For matrix duplicates out-of-limit results were as follows: 0 percent for indicator parameters, 1.9 percent for ammonia and anions, and 5.9 percent for radiochemistry parameters.

EPA Water Supply/Water Pollution Programs: The primary analytical laboratory participates in the U.S. Environmental Protection Agency (EPA) Water Supply/Water Pollution (WS/WP) programs. In these programs, EPA distributes standard water samples as blind samples to participating laboratories. These samples contain specific organic and inorganic analytes at concentrations unknown to the participating laboratories. After analysis, the labs submit their results to the EPA. Regression equations are used to determine acceptance and warning limits. The results of these studies independently verify the level of laboratory performance and are expressed as a percentage of EPA-acceptable results.

No new EPA WP/WS studies were received from the primary lab. However the lab responded to the unacceptable results in the WP study analyzed in November 1998. Three sample types (alkalinity and two Polychlorinated biphenyls in oil) were incorrectly reported and were actually within control limits. Volatile aromatics were all present at double the true value; the lab believes that the sample was double-spiked. Total phenolics were high because the baseline had not been allowed to stabilize from an interference. The total Kjeldahl nitrogen (TKN) was the only sample type for which no definite explanation was given; incomplete digestion was hypothesized. However, TKN has not been performed on Hanford samples since the prior acceptable WP results; therefore, no impact is anticipated. It appears that the unacceptable results on the WP samples will not significantly affect Hanford results because most are readily corrected.

National Exposure Research Laboratory (NERL) Performance Evaluation (PE) Studies: NERL sends out gamma, iodine-131, gross alpha, gross beta, tritium, radium, strontium, and uranium samples in a water matrix semi-annually to participating laboratories. Plutonium samples are sent out annually. Warning limits for laboratory results are at two normalized standard deviations above and below the known value. Control limits are at three normalized standard deviations above and below the known value.

The results from five NERL PE studies were reported since the last quarterly QC summary was written. These studies were for strontium (July 1998), gross alpha-beta (July 1998), tritium (August 1998), iodine (September 1998), and uranium-radium (1998). All of the results were

within the control limits established by the EPA.

U.S. Department of Energy Quality Assessment Program: This program is conducted by the Environmental Measurements Laboratory (EML) and is designed to evaluate the performance of participating laboratories through the analysis of air filter, soil, vegetation, and water samples containing radionuclides. Only the water results are considered in this report. Acceptable results should fall within the 15th and 85th percentile of the cumulative normalized distribution. Results are within warning limits if they fall between the 5th and 15th percentile or the 85th and 95th percentile. Results less than the 5th percentile or greater than the 95th percentile are "not acceptable." During the current reporting period, results were received on the primary lab's analyses of water samples for gross alpha, gross beta, ^{3}H, ^{54}Mn, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}U, total uranium, ^{238}Pu, ^{239}Pu, and ^{241}Am. The ^{238}Pu result was within the warning limits, but all other results were acceptable.